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GB 2006296 A **GB 1543346 A** **EP 0124496 A2**
EP 0003377 A1 **US 4300981 A**

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INT CL^5 **D21F 1/00 9/00 9/02 11/00 11/02 11/04 , D21H 27/00 27/30 27/40**
Online databases:WPI

(54) Method for making stratified tissue

(57) A stratified tissue web, such as is useful for facial or bath tissue, is formed by couching together two separately, formed webs at machine speeds of about 2000 feet per minute (609.6 metres per minute) or greater to provide a tissue web having equivalently soft surfaces on both sides of the tissue. The webs are laid as slurries by respective headboxes (1, 10) on wires (2, 11), suction is applied (at 20) and drying takes place on a Yankee dryer (30). Alternatively, hot air through-drying may also be used.

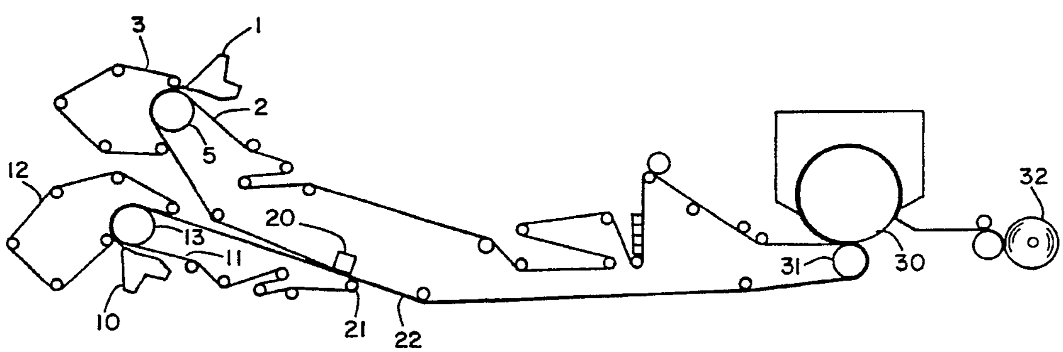

FIG. I

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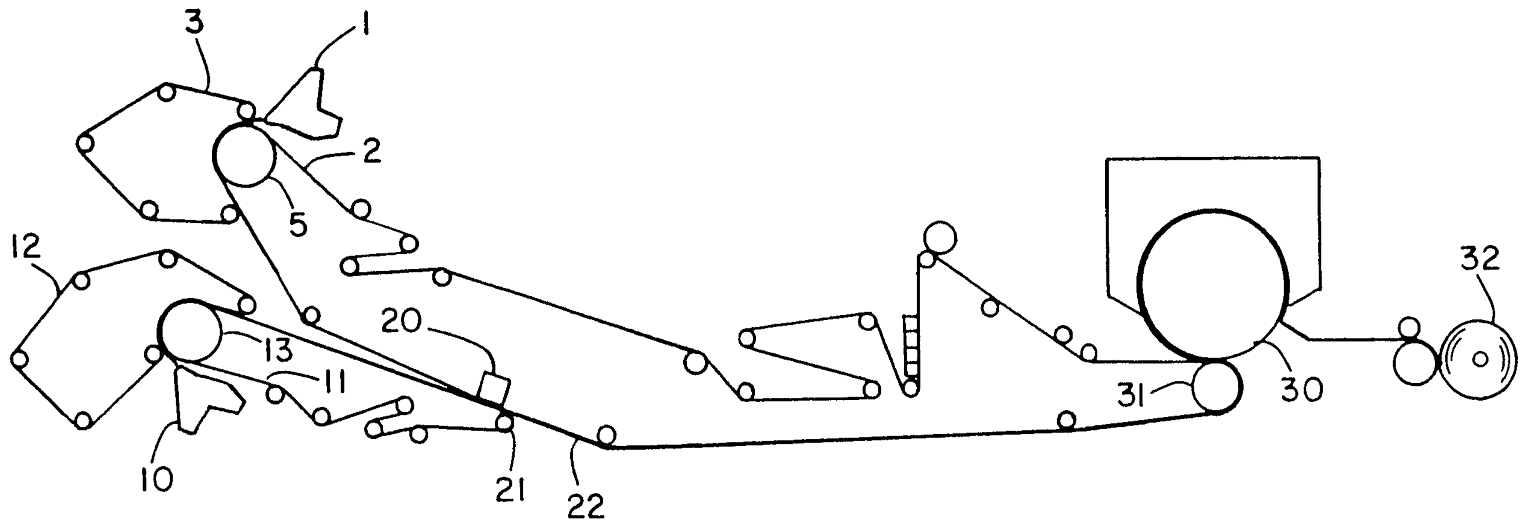

FIG. 1

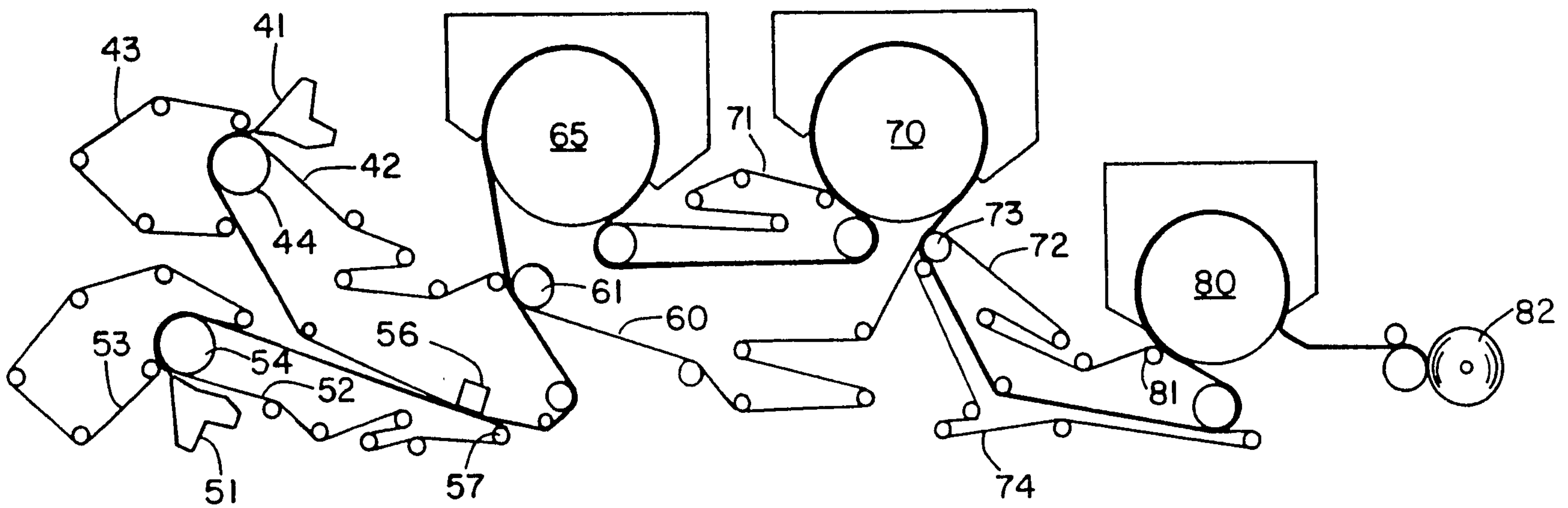

FIG. 2

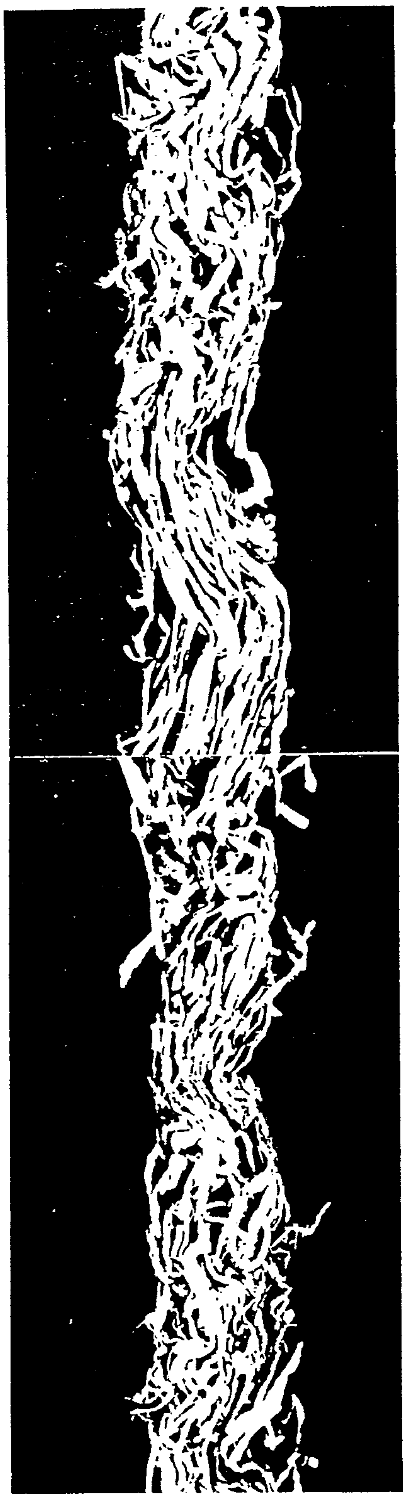

FIG. 3A

FIG. 3B

FIG. 3C

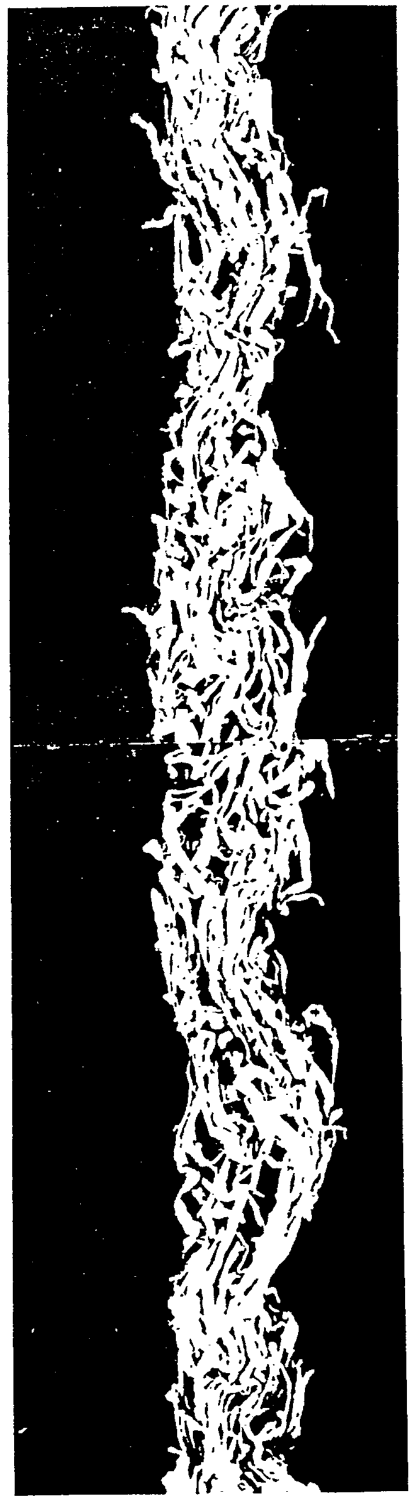

FIG. 3D

FIG. 3E

FIG. 3F

FIG. 4A

FIG. 4B

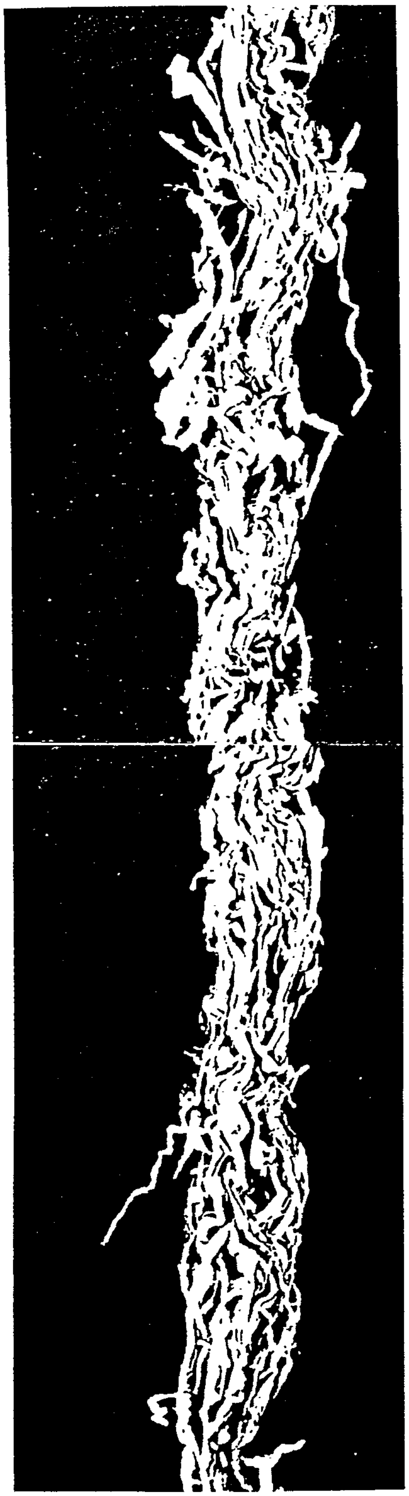

FIG. 4C

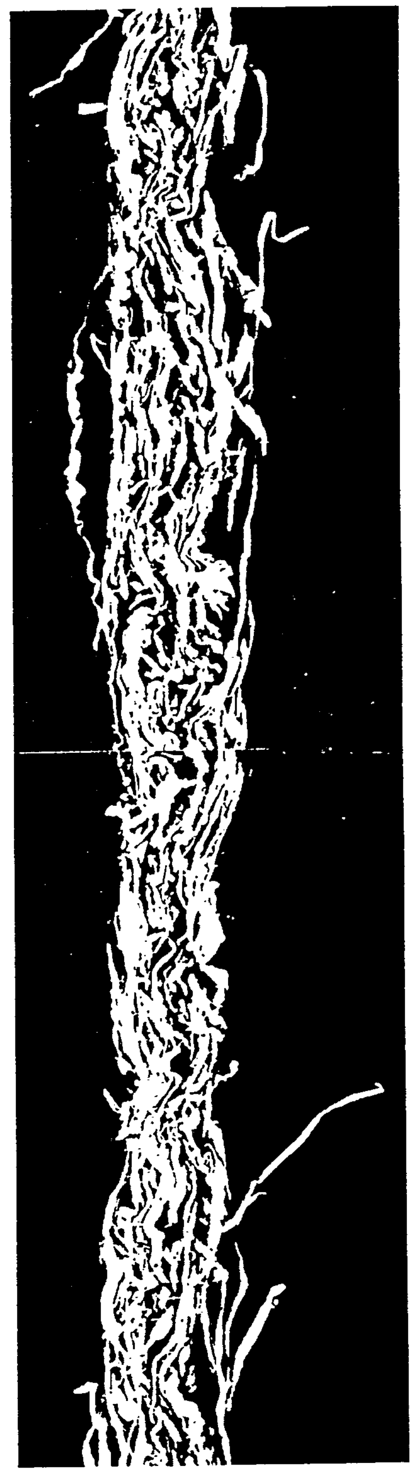

FIG. 4D

FIG. 4E

FIG. 4F

METHOD FOR MAKING STRATIFIED TISSUE

In the manufacture of tissue products such as facial and bath tissue, it is well known that layering of the tissue web can be advantageous in that fibers which elicit a favorable tactile response can be positioned on the outside surfaces of the product while fibers which are less desireable for tactile purposes but which are nevertheless useful for other purposes can be concentrated in the middle of the product. For example, it is generally recognized that a high concentration of eucalyptus fibers is desireable in the outside layers of tissue products, whereas the longer softwood fibers are useful for adding strength to the middle layer of the product.

One method of making a layered tissue product is a method known as "couching". Couching involves independently forming two tissue webs and combining them while still very wet to form a layered web. When dried, the resulting layered web has virtually 100% layer purity because the individual webs are sufficiently dewatered before being combined so that the fibers in each web are no longer mobile. Couching has been known for many years and has been used on cylinder machines at slow speeds for making heavy basis weight products such as paper board, but has not been implemented on a commercial scale for light weight sheets such as tissues. Instead, the use of layered headboxes has become a commonplace means for making layered tissue products. Manufacturing layered tissue products with a layered headbox has the advantage of requiring only one headbox and forming section, which is less expensive and less complex from an operating standpoint. Insofar as couching has been considered as simply an alternative form of layering with no particular advantage over layered headboxes, layered headboxes have become the method for commercially manufacturing layered tissue products.

It has now been discovered that couching can provide advantages over the use of a layered headbox and, when operated at sufficiently high speed, couching can provide a tissue product with unexpectedly improved properties. More specifically, it has been discovered that a couching process can be operated at line speeds of about 2000 feet per minute or greater and, when doing so, a stratified or layered single-ply tissue sheet can be produced that feels substantially the same on both sides (referred to herein as a "one-sided" feel). This is entirely unexpected, since single-ply tissue products, whether or not layered, normally have distinctly different feel properties on each side of the sheet. This normal "two-sidedness" is partly due to the forming geometry, wherein each side of the web is subjected to differing dewatering drainage conditions, but is also due to the creping operation, in which only one side of the web is in contact with the creping cylinder or Yankee dryer (the "dryer side" of the web). In general, the side of the web not in contact with the Yankee surface (the "air side" of the web) has a more coarse feel than the dryer side of the web, due to the different nature of the crepe folds imparted to each side during the creping operation.

On the other hand, in the practice of this invention, both sides of the tissue sheet feel substantially the same, even though they still differ in terms of their crepe structure. Without being bound to any theory, it is believed that the resulting substantially one-sided feel of the products of this invention is at least partly due to the minimization of z-direction bonding between the layers as the speed of production is increased. A slip plane between the couched layers develops and as a result the normally sharp air side crepe folds are eliminated or greatly reduced during creping. Although difficult to quantify, a unique combination of crepe fold amplitude and crepe fold frequency imparted by high speed couching contributes to the one-sidedness of the sheet. The sidedness of a tissue sheet can be quantified by measuring the Human Tactile Response Index (HTR Index), which utilizes a surface profile measuring device and which will be hereinafter defined.

Hence in one aspect, the invention resides in a method for making a single-ply stratified creped tissue comprising: (a) forming a first wet embryonic web by depositing a first aqueous slurry of papermaking fibers onto a first endless foraminous forming fabric; (b) forming a second wet embryonic web by depositing a second aqueous slurry of papermaking fibers onto a second endless foraminous forming fabric; (c) combining said first and second wet webs at a speed of about 2000 feet per minute or greater while at a consistency of from about 10 to about 30 percent to form a stratified web comprising a first outer stratum and a second outer stratum; (d) dewatering and drying the stratified web to a consistency of about 90 percent or greater; and (f) creping the stratified web to form a creped tissue web having a substantially one-sided feel.

In another aspect, the invention resides in a single-ply, stratified, once-creped tissue web having a dryer side and an air side, wherein the difference in the HTR between the two sides is about 0.5 or less, advantageously about 0.4 or less, and preferably about 0.3 or less. Alternatively, the sidedness of the tissue web can be expressed as what is hereinafter referred to as the "Normalized HTR", which is defined by the following formula: Normalized HTR = Average HTR * (Air Side HTR - Dryer Side HTR), wherein the Average HTR is the average of the Air Side HTR and the Dryer Side HTR. The Normalized HTR is about 0.75 or less, preferably about 0.50 or less, more preferably about 0.25 or less, and still more preferably about 0.10 or less.

As used herein, "tissue" means a cellulosic web suitable for use as a facial tissue, bath tissue, or the like. Such tissues comprise papermaking fibers well known in the art and have basis weights of from about 10 to about 30 grams per square meter.

In carrying out the method of this invention, the first and second embryonic webs must be couched together at a machine speed of about 2000 feet per minute or greater, preferably about 2500 feet per minute or greater, and more preferably about 3000 feet per minute or greater. While the couching speed must be high, it is within the scope of this invention that the speeds of the two embryonic webs can be the same or different. Differential speed couching can provide a means for altering the structure of the web to manipulate the stretch, strength and bulk of the final tissue product. Speed differentials can be from about 1 to about 50 percent or more, more specifically from about 1 to about 35 percent, and still more specifically, from about 1 to about 10 percent can be used.

At the same time, the consistency of the two webs must be from about 10 to about 30 weight percent, preferably from about 15 to about 25 weight percent, and more preferably about 20 percent. If the consistency of the two webs is below about 10 percent, too much water must be moved through one of the embryonic webs causing sheet disruption. If the consistency of the two webs is above about 30 percent, the strength of the bond between the layers becomes so low that the sheet fractures at the creping blade. The consistency of the two webs can be the same or different.

The basis weight of the embryonic webs can be from about 10 to about 30 grams per square meter, more specifically from about 15 to about 20 grams per square meter. The basis weights of the two webs can be the same or different.

Creping of the stratified web can be carried out using any suitable creping adhesive. It is advantageous to calender the creped web to further smoothen the resulting tissue surfaces as desired.

As used herein, the HTR is as described in U.S. Patent No. 4,300,981 issued November 17, 1981 to Jerry E. Carstens entitled "Layered Paper Having a Soft and Smooth Velutinous Surface, and Method of Making Such Paper", which is herein incorporated by reference, except that the area under the curve for determining the HTR as described in the abovesaid Carstens patent was determined by counting squares, whereas for purposes herein the area was determined by a computer program. The name of the computer program is "IP Software/Application Utilities for Series 2600 Fourier Analyzers" and is available from Textronix Inc., Campbell, California, as Part No.Q3JTP20, Version 2.25 (March 4,1992). The math function is used to analyze the frequency spectrum acquired by the analyzer. It has four windows (A,B,C,D) for placing spectrum and allows the mathematic manipulation of those spectrum. The following script details the analysis for HTR:

1. Read the ASPEC portion of the frequency spectrum into A.
2. Take the square root of the spectrum in A and place it in B.

3. Multiply the spectrum in B by the real number 2 and imaginary 0 and place the result in B.
4. Modify the spectrum in B using the Lines function to zero the spectrum from 0 to 1 HZ and 5 to 20 HZ.
5. Subtract from the spectrum in B the real number 0.063 and imaginary 0 and place the result in C.
6. Take the magnitude of the spectrum in C and place the result in C.
7. Add the spectrum in B to the spectrum in C and place the result in D.
8. Subtract from the spectrum in D the real number 0.063 and imaginary 0 and place the result in C.
9. Divide the spectrum in C by the real number 2 and imaginary 0 and place the result in C.
10. Integrate the frequency of the spectrum in C and place it in D.
11. Multiply the spectrum in D by the real number 15.87 and imaginary 0 and place the result in D.
12. The HTR result is displayed below the D window.

Embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a schematic flow diagram of a wet-pressing process in accordance with this invention.

Figure 2 is a schematic flow diagram of a throughdrying process in accordance with this invention.

Figures 3A - 3F are cross-sectional photographs of a layered, creped tissue made using a layered headbox.

Figures 4A - 4F are cross-sectional photographs of a layered, creped tissue comparable to that of Figure 3, but made in accordance with this invention.

Referring to the Drawings, the invention will be described in greater detail. Several of the Figures show many of the rolls used for the various fabric runs for the sake of completeness, but the rolls are not individually described because they are not essential for practicing this invention and their function is readily apparent from the drawings. Figure 1 shows a method of making a wet-pressed tissue in accordance with this invention. Shown is a first headbox 1 from which a first aqueous suspension of papermaking fibers is deposited between an endless papermaking felt 2 and an endless forming fabric 3 to form a first wet web. Both fabrics partially wrap the forming roll 5 such that the first wet web is partially dewatered by flinging water through the forming fabric 3 due to centrifugal force and by the water absorbing properties of the felt. This particular forming configuration is commonly referred to as a crescent former. The papermaking felts useful for such a process are many and are well known in the art. Specific felts include the Albany Duracomb SG and the Albany Duravent, commercially available from Albany International Corporation, Albany Felt Division, Albany, New York. The forming fabric can be any forming fabric having a fiber support index of about 150 or greater. Specific suitable forming fabrics include, without limitation: single layer fabrics, such as the Appleton Wire 94M available from Albany International Corporation, Appleton Wire Division, Menasha Wisconsin; double layer fabrics, such as the Asten 866 available from Asten Group, Appleton, Wisconsin; and triple layer fabrics, such as the Lindsay 3080, available from Lindsay Wire, Florence, Mississippi.

The aqueous suspension of papermaking fibers provided to the headboxes can be prepared in a manner well known in the papermaking arts and the consistency of the aqueous suspension of papermaking fibers leaving the headbox can be from about 0.05 to about 2 percent, preferably about 0.2 percent. The first headbox 1 can be a layered headbox with two or more layering chambers which delivers a stratified or layered first wet web, or it can be a monolayered headbox which delivers a blended or homogeneous first wet web.

A second headbox 10 deposits a second aqueous suspension of papermaking fibers between an endless inner forming fabric 11 and an endless outer forming fabric 12 to form a second wet web. Both forming fabrics partially wrap a forming roll 13, which partially dewaters the wet web and causes the wet web to stay with the inner forming fabric 11. This forming configuration is commonly referred to as a twin-wire former. As with the first headbox, the second headbox can be a layering headbox or a monolayered headbox.

Suitable forming fabrics for the inner forming fabric 11 include single layer fabrics such as Appleton Wire 84M, double layer fabrics such as the Asten 856, and triple layer fabrics such as the Lindsay 3070. Suitable forming fabrics for the outer forming fabric 12 of the second headbox include those forming fabrics previously mentioned with respect to the first headbox forming fabric.

After initial formation of the first and second wet webs, the two webs are brought together in contacting relationship (couched) while at a consistency of from about 10 to about 30 percent. Whatever consistency is selected, it is preferable that the consistencies of the two wet webs be substantially the same. Couching is achieved by bringing the first wet web into contact with the second wet web at vacuum suction box 20, after which time the inner forming fabric is peeled away at turning roll 21.

After the two webs have been couched together to form a consolidated web 22 supported by the felt, dewatering, drying and creping of the consolidated web is achieved in the conventional manner. More specifically, the couched web is further dewatered and transferred to a Yankee dryer 30 using a pressure roll 31, which serves to express water from the web, which is absorbed by the felt, and causes the web to adhere to the surface of the Yankee. The web is then dried, creped and wound into a roll 32 for subsequent converting into the final creped product.

Figure 2 illustrates another embodiment of this invention in which a couched web is formed using two twin-wire formers and is thereafter throughdried by passing hot air through the wet web. Shown is a first headbox 41 from which a first aqueous suspension of papermaking fibers is deposited between an endless inner forming fabric 42 and an endless outer forming fabric 43 to form a first wet web. Both fabrics partially wrap a forming roll 44 and the wet web remains with the inner forming fabric after leaving the forming zone.

A second headbox 51 deposits a second aqueous suspension of papermaking fibers between an endless inner forming fabric 52 and an endless outer forming fabric 53 to form a second wet web. Both forming fabrics partially wrap a forming roll 54. The wet web remains with the inner forming fabric 52 as it leaves the forming zone.

The first and second wet webs are couched together by bringing them into contacting relationship at vacuum suction box 56, after which the inner fabric is peeled away at turning roll 57. The consolidated web remains with inner forming fabric 42 and is transferred to throughdrying fabric 60 at transfer roll 61, in which vacuum is used to adhere the web to the throughdrying fabric. The web is then dried in a conventional manner by passing over two throughdryers 65 and 70 in series while supported on the throughdrying fabric 60. In between the throughdryers the web is sandwiched between the throughdryer fabric 60 and intermediate fabric 71 which serves to support and contain the sheet between the throughdryers. Upon leaving the second throughdryer, the dried web is transferred to fabric 72 as the web passes around roll 73. Optionally the web can be sandwiched between fabric 72 and fabric 74 to support and contain the web until it is pressed onto the dryer surface. The web is then transferred to Yankee dryer 80 at pressure roll 81 and thereafter creped and wound onto a roll 82 for subsequent converting.

Figures 3A - 3F and 4A - 4F are magnified (100X) cross-sectional photographs of layered tissues made by two different methods. The tissue cross-sections illustrated in Figures 3A - 3F are from layered tissues produced at high speed (3400 feet per minute) using a layered headbox as described in Example 4 below. Figures 4A - 4F are cross-sections from layered tissues made in accordance with this invention using couching at the same high speed, as described in Example 6. On the whole, the photographs show that the surfaces of the tissues of this invention are flatter and have less undulations than the surfaces of the tissues produced with the layered headbox. This difference in surface profile is captured by the HTR measurements.

Examples

Several tissues were made for comparative purposes using different methods, including the method of this invention. In particular, Example 1 illustrates a homogeneous or monolayered tissue made at slow speed, Example 2 illustrates a layered tissue made at slow speed, Examples 3 and 4 illustrate a layered tissue made at high speeds, and Examples 5 and 6 illustrate a layered tissue made by couching at high speeds (this invention). For all of the Examples, the resulting tissues were subjectively tested for side-to-side softness by a trained sensory panel and/or by the HTR measurement. The sensory panelists feel each side of the tissue sample and assign a softness value of from 1 (very low softness) to 10 (very high softness) based on control standards.

Example 1. A mono-layered throughdried tissue was made from 100% virgin papermaking fibers. Specifically, the tissue was a mixture of 70% Cenibra eucalyptus and 30% northern softwood kraft fibers. The mixture was delivered to the forming fabric (Appleton Wire 94M) at 0.05% consistency and at a speed of 60 feet per minute. The resultant web was throughdried, pressed onto the surface of a Yankee dryer, and creped. The creped sheet was wound into a softroll and converted into one-ply facial tissue with the following characteristics: basis weight, 32 grams per square meter; geometric mean tensile strength per 3 inches width, 620 grams; dryer side softness, 7.6; air side softness, 6.9.

Example 2. A two-layered throughdried tissue was made from 100% virgin papermaking fibers. Specifically, each layer was a mixture of 70% Cenibra eucalyptus and 30% northern hardwood kraft fibers and each layer constituted 50 weight percent of the total sheet. Each layer was independently formed on separate forming fabrics (Appleton Wire 94M) at 0.05% consistency and the resulting webs were couched together at about 60 feet per minute (slow speed) at approximately 10% consistency to form a single web. The resultant web was throughdried, pressed onto the surface of a Yankee dryer, and creped. The sheet was wound into a softroll and converted into one-ply facial tissue with the following characteristics: basis weight, 32 grams per square meter; geometric mean tensile strength per 3 inches width, 660 grams; dryer side softness, 7.6; air side softness, 6.5. Although the layers were couched together, the speed was very slow and the resulting tissue had significant softness differences from side to side.

Ex le 3. A three-layered tissue was made from 100% virgin papermak fibers from a layered headbox. Specifically, the fibers in the layer contacting the roll side of the forming unit (in this case the dryer side of the web) were a mixture of 50% Cenibra eucalyptus and 50% northern softwood kraft fibers and constituted 25% of the total sheet by weight. The fibers in the layer contacting the wire side of the forming unit (in this case the air side of the sheet) were a mixture of 80% Cenibra eucalyptus and 20% northern softwood kraft fibers and also constituted 25% of the sheet by weight. The center layer of fibers was a mixture of 60% Cenibra eucalyptus and 40% northern softwood kraft fibers and constituted 50% of the sheet by weight. The three layers were simultaneously delivered to the forming fabric (Lindsay Wire 3080) at 0.2% consistency and 3000 feet per minute. The web was throughdried, pressed onto the surface of a Yankee dryer, and creped. The sheet was wound into a softroll and converted into one-ply facial tissue with the following characteristics: basis weight, 29 grams per square meter; geometric mean tensile strength per 3 inches width, 715 grams; dryer side softness, 7.3; air side softness, 6.5; dryer side HTR, 1.47; air side HTR, 2.00. Again, there was a significant two-sidedness to the sheet in terms of softness. This two-sidedness is also reflected by the differences in the HTR values. The Normalized HTR was 0.92.

<u>Example 4.</u> A layered tissue was made as described in Example 3, except the tissue was formed at a speed of 3500 feet per minute. The resulting tissue had the following characteristics: basis weight, 29 grams per square meter; geometric mean tensile strength per 3 inches width, 667 grams; dryer side softness, 7.67; air side softness, 6.44; dryer side HTR, 0.741; and air side HTR, 1.860. The Normalized HTR was 1.46.

<u>Example 5 (This Invention).</u> A two-layered tissue was made from 100% virgin papermaking fibers. Specifically, the fibers in the dryer side layer of the sheet were a mixture of 50% Cenibra eucalyptus and 50% northern softwood kraft fibers and constituted 60% of the sheet by weight. The fibers in the air side layer of the sheet were a mixture of 80% Cenibra eucalyptus and 20% northern softwood kraft fibers and constituted 40% of the sheet by weight. Each layer was independently formed on separate forming fabrics (Lindsay Wire 3080) at 0.1% consistency and the resulting webs were couched together at about 3000 feet per minute at approximately 13%

consistency to form a single stratified web. The web was through-air-dried, pressed onto the surface of a Yankee dryer and further dried to a consistency of about 94 percent, and creped. The resulting tissue sheet was wound into a softroll and converted to one-ply facial tissue with the following characteristics: basis weight, 29 grams per square meter; geometric mean tensile strength per 3 inches width, 780 grams; dryer side softness, 7.1; air side softness, 7.3; dryer side HTR, 0.353; air side HTR, 0.451. The Normalized HTR was 0.04.

Example 6 (This Invention). A couched tissue was made as described in Example 5, except the resulting webs were couched together at a speed of 3500 feet per minute. The final tissue had the following characteristics: basis weight, 29 grams per square meter; geometric mean tensile strength per 3 inches width, 748; dryer side softness, 7.23; air side softness, 7.22; dryer side HTR, 0.118; and air side HTR, 0.326. The Normalized HTR was 0.05.

The foregoing examples illustrate the improvement in one-sidedness obtained by couching two wet webs together at high speed (Examples 5 and 6) as compared to a monolayered tissue at slow speed (Example 1), a layered tissue made by couching two webs together at slow speed (Example 2), and a layered tissue made with a layered headbox (not couched) at high speed (Examples 3 and 4). The difference in panel softness from side to side was only 0.2 points or less, compared to side-to-side softness differences of 0.7, 1.1 and 1.3 for the tissues produced by the other methods. The difference in HTR values from side to side for the layered tissue made in accordance with this invention was 0.098 and 0.208, whereas the side-to-side HTR differences for the comparable high speed layered tissues (Examples 3 and 4) was 0.530 and 1.119. The Normalized HTR values for the high speed couched tissues of this invention (Examples 5 and 6) were 0.04 and 0.05, whereas the Normalized HTR values for the high speed layered headbox tissues (Examples 3 and 4) were 0.92 and 1.46. Hence it is clear that high speed couching can produce a tissue having significantly improved side-to-side softness uniformity.

It will be appreciated that the foregoing examples, given for purposes of illustration, are not to be construed as limiting the scope of this invention, which is defined by the following claims and all equivalents thereto.

Claims:

1. A method for making a single-ply stratified tissue comprising (a) forming a first embryonic web by depositing first aqueous slurry of papermaking fibers onto a first endless foraminous forming fabric; (b) forming a second embryonic web by depositing a second aqueous slurry of papermaking fibers onto a second endless foraminous forming fabric; (c) combining said first and second embryonic webs at a speed of about 2000 feet per minute or greater while at a consistency of from about 10 to about 30 percent to form a stratified web comprising a first outer stratum and a second outer stratum; (d) dewatering and drying the stratified web to a consistency of about 90 weight percent or greater; and (f) creping the stratified web.

2. The method of Claim 1 wherein the first and second embryonic webs are combined at a speed of about 2500 feet per minute or greater.

3. The method of Claim 1 wherein the first and second embryonic webs are combined at a speed of about 3000 feet per minute or greater.

4. The method of Claim 1 wherein the first and second embryonic webs are combined at a speed of from about 2500 to about 4000 feet per minute.

5. The method of any preceding claim wherein the first and second embryonic webs are combined at about the same speed.

6. The method of any of Claims 1 to 4 wherein the first and second embryonic webs are combined at different speeds.

7. The method of Claim 6 wherein the speed difference is from about 1 to about 50 percent.

8. The method of Claim 6 wherein the speed difference is from about 1 to about 10 percent.

9. The method of any preceding Claim wherein the consistency of the first and second embryonic webs when combined with each other is from about 15 to about 25 weight percent.

10. The method of any preceding Claim wherein the consistency of the first and second embryonic webs when combined with each other is about 20 percent.

11. The method of any preceding Claim wherein the consistency of the first and second embryonic webs when combined with each other is about the same.

12. The method of any of Claims 1 to 10 wherein the consistency of the first and second embryonic webs when combined with each other is different.

13. The method of any preceding Claim wherein the basis weight of the first and second embryonic webs is from about 10 to about 30 grams per square meter.

14. The method of any preceding Claim wherein the basis weight of the first and second embryonic webs is from about 15 to about 20 grams per square meter.

15. The method of any preceding Claim wherein the basis weight of the first and second embryonic webs is different.

16. A single-ply, stratified tissue web having a dryer side and an air side, wherein the softness of the two sides is substantially the same.

17. The tissue web of Claim 16 wherein the side-to-side difference in the HTR values is about 0.5 or less.

18. The tissue web of Claim 16 wherein the side-to-side difference in the HTR values is about 0.4 or less.

19. The tissue web of Claim 16 wherein the side-to-side difference in the HTR values is about 0.3 or less.

20. The tissue web of Claim 16 wherein the side-to-side difference in the HTR values is about 0.2 or less.

21. The tissue web of Claim 16 wherein the Normalized HTR is about 0.75 or less.

22. The tissue web of Claim 16 wherein the Normalized HTR is about 0.50 or less.

23. The tissue web of Claim 16 wherein the Normalized HTR is about 0.25 or less.

24. The tissue web of Claim 16 wherein the Normalized HTR is about 0.10 or less.

25. A method for making a single-ply stratified tissue substantially as hereinbefore described with reference to Figs. 1 or 2 of the accompanying drawings.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9422790.7

Relevant Technical Fields

(i) UK Cl (Ed.M) D1R (RABX, RBF, RFCA, RFCB, RFCC, RFZ, RGCA, RGCB, RGCC, RGZ); D2A (ABA, ABB, AV)

(ii) Int Cl (Ed.5) D21F 1/00, 9/00, 9/02, 11/00, 11/02, 11/04; D21H 27/00, 27/30, 27/40

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES: WPI

Search Examiner
MR A LITTLEJOHN

Date of completion of Search
16 DECEMBER 1994

Documents considered relevant following a search in respect of Claims :-
1-25

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2006296 A	(KIMBERLY-CLARK) see whole document, page 3 lines 50-65 and page 4 line 27	1-15
Y	GB 1543346	(PROCTER & GAMBLE) see whole document, eg page 3 lines 83-123, page 6 line 78 - page 7 line 20	1-15
Y	EP 0124496 A2	(KORSNAS) see whole document, eg page 2 line 28 - page 3 line 11	1
Y	EP 0003377 A1	(PROCTER & GAMBLE) see whole document, especially Figure 2 and Example 2 on pages 31-33 and US 4225382	1-15
Y	US 4300981	(PROCTER & GAMBLE) see whole document, especially Figures 46, 47	1

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

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TITLE: Making stratified tissues with equivalent soft surfaces on both sides by couching separately formed webs at high speeds and increased consistencies

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PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
GB 2283766 A	May 17, 1995	EN
FR 2712314 A1	May 19, 1995	FR
WO 9513424 A1	May 18, 1995	EN
CA 2119432 A	May 13, 1995	EN
AU 9510882 A	May 29, 1995	EN

DESIGNATED-STATES: AM AT AU BB BG BR BY CA CH CN CZ DE DK ES FI GB GE HU JP KE KG KP KR KZ LK LT LU LV MD MG MN MW NL NO NZ PL PT RO RU SD SE SI SK TJ TT UA UZ VN AT BE CH DE DK ES FR GB GR IE IT KE LU MC MW NL OA PT SD SE SZ

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
GB 2283766A	N/A	1994GB-022790	November 11, 1994
CA 2119432A	N/A	1994CA-2119432	March 18, 1994
FR 2712314A1	N/A	1994FR-012952	October 28, 1994
WO1995013424A1	N/A	1994WO-US12694	November 4, 1994
AU 9510882A	Based on	1995AU-010882	November 4, 1994

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	D21F11/04 20060101
CIPS	D21F11/14 20060101

ABSTRACTED-PUB-NO: GB 2283766 A

BASIC-ABSTRACT:

A single-ply stratified tissue is formed by couching two separately formed webs at speeds of 2,000 ft/minute or greater at a consistency of 10-30% by weight to give equivalent surfaces on both sides of the tissue. The stratified web is dewatered and dried to 90% or more by weight consistency followed by creping of the web.

Pref. the webs are formed by respective headboxes 91,10) on wires (2,11) and are suction couched (20) together. A Yankee dryer (30) or hot air through drying means are used to dry the stratified web. Web speeds of 2,000-4,000 (pref. 3,000) feet/minute are used with web speed differences of 0-50%. Web consistency of 10-30 (pref. 20) % by weight is achieved before couching with a web basis weight of 10-30 (pref. 20) gms/sq. metre with the same or

different basis weights. The combined layers are creped using any suitable adhesive and are pref. calendered to smooth the finished tissue surfaces.

USE - To make bath or facial tissues with equivalently soft surfaces on both sides.

ADVANTAGE - High speed couching gives unexpectedly improved tissue qualities.

CHOSEN-DRAWING: Dwg.1/4

TITLE-TERMS: STRATIFIED TISSUE EQUIVALENT SOFT SURFACE SIDE COUCHING SEPARATE FORMING WEB HIGH SPEED INCREASE CONSISTENCY

DERWENT-CLASS: F09

CPI-CODES: F05-A06;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: 1995-080035